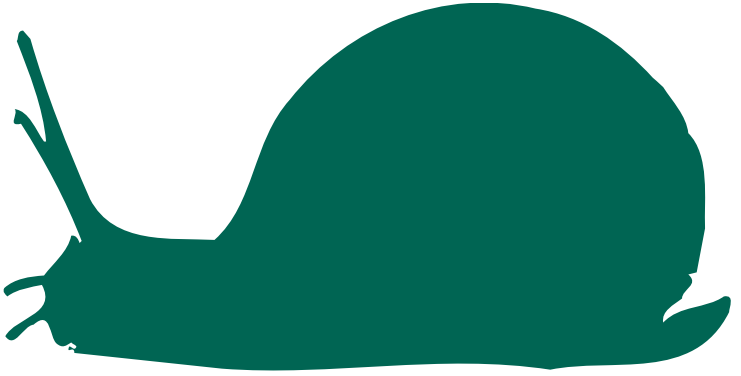
Field Guide to Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan

June 1999



Bureau of Land Management
Oregon State Office

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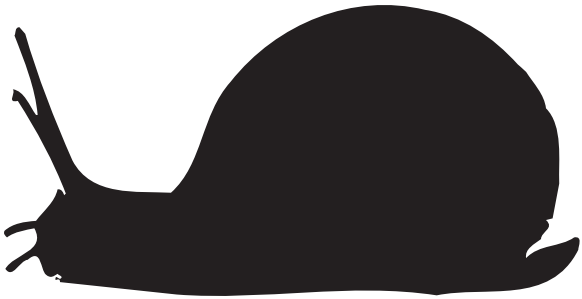

Bureau of Land Management
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Table of Contents

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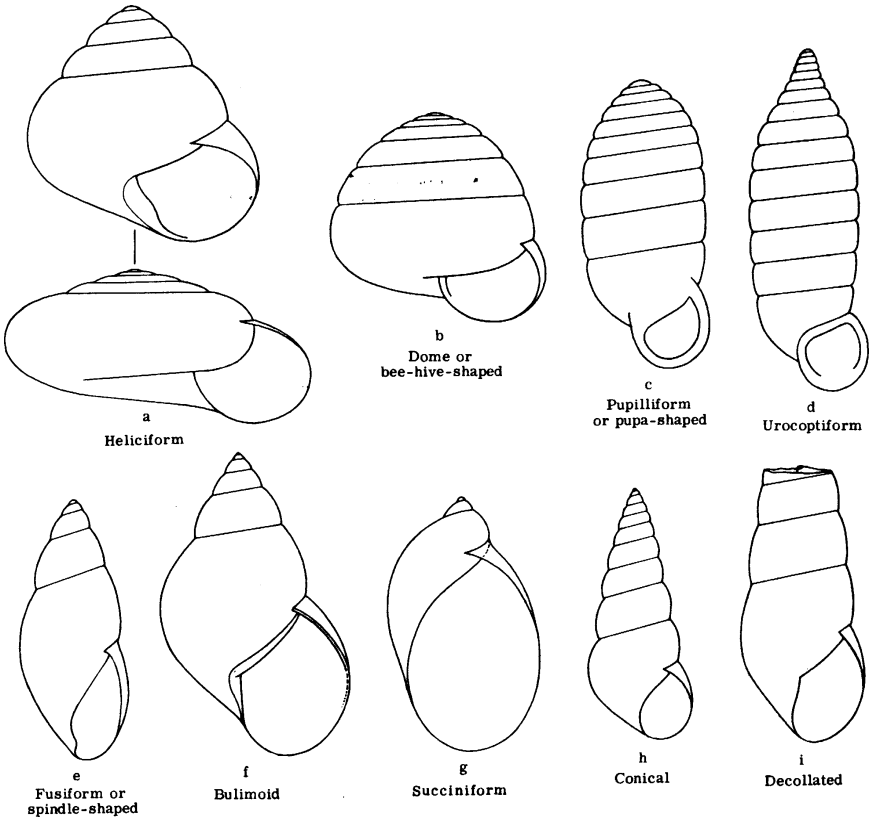
Introduction

This field guide is intended for use in identifying 27 terrestrial mollusk species listed in Table C-3 or page C-6 of the Record of Decision for the Northwest Forest Plan, which require survey prior to ground disturbing activities. This guide is provided in loose leaf format allowing sections to be removed and taken to the field. Also, it provides a method for updating current information with new illustrations and range data.

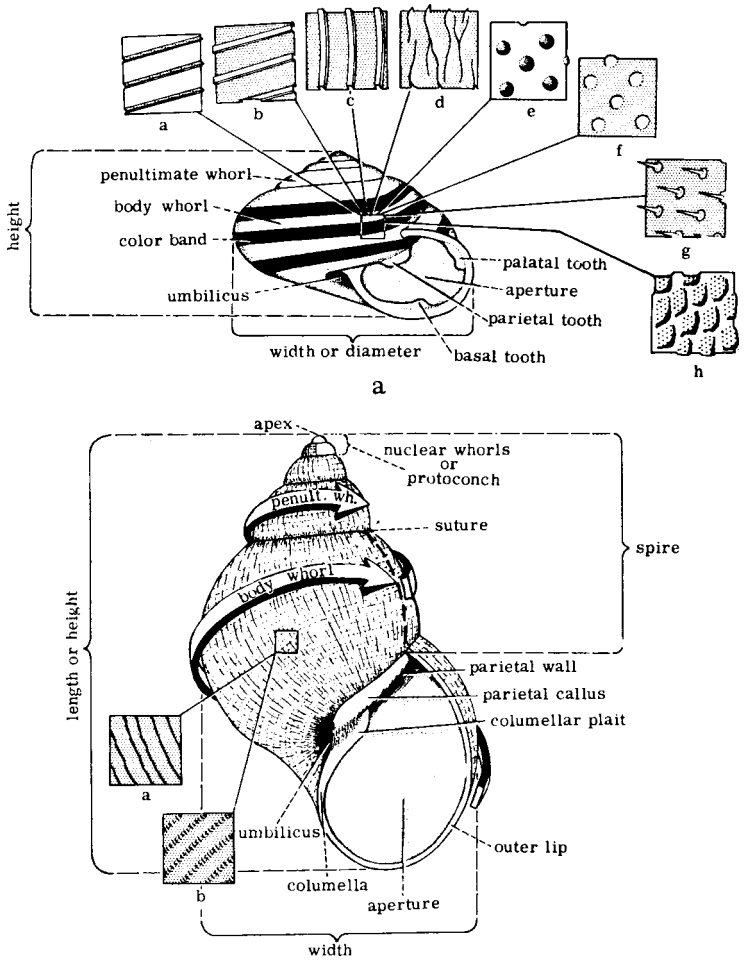
The first section offers some basic information about mollusk morphology and terminology used in the descriptive text. Refer to the glossary provided at the end of the guide for more detailed explanations of terms.

The main body of the guide contains photographs, species descriptions, and range and habitat information for the terrestrial mollusk species listed in the Record of Decision for the Northwest Forest Plan. This section is divided into two parts (twenty terrestrial snail species and seven terrestrial slug species) each organized alphabetically by scientific name. Information and photographs of similar species are also included in this section.

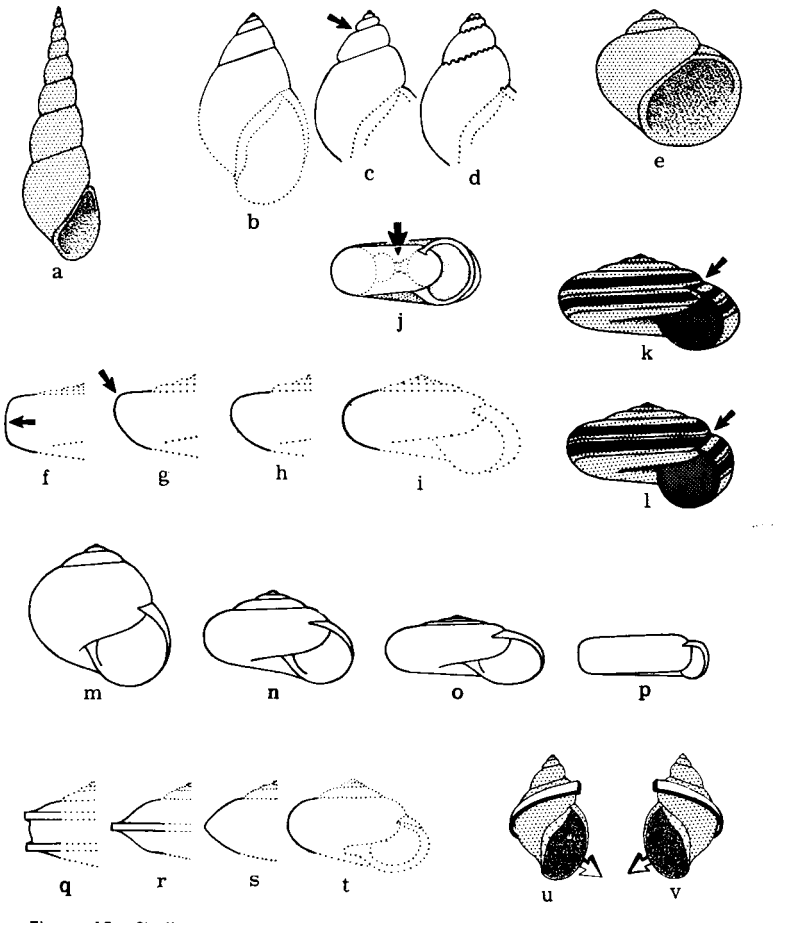
Shell Shapes



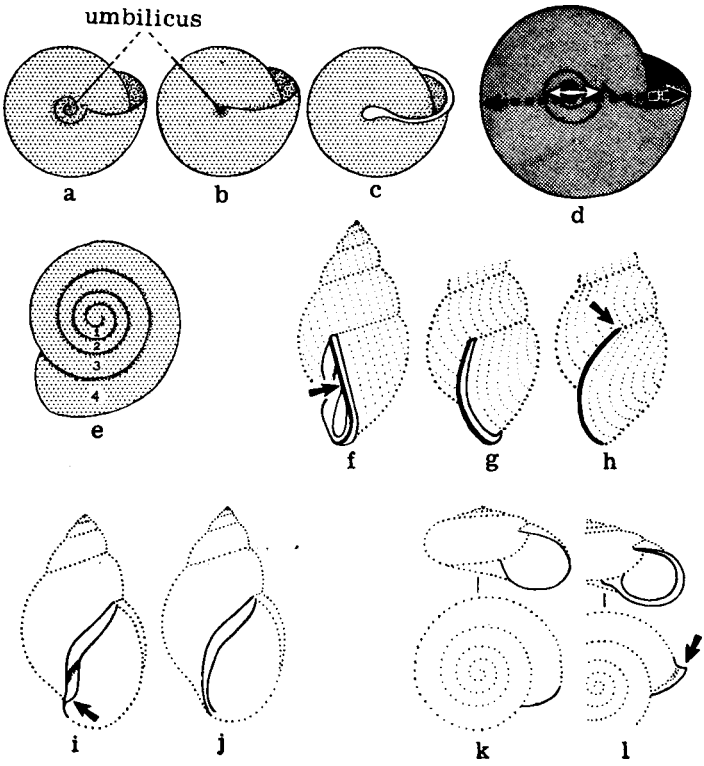
Shell Terminology



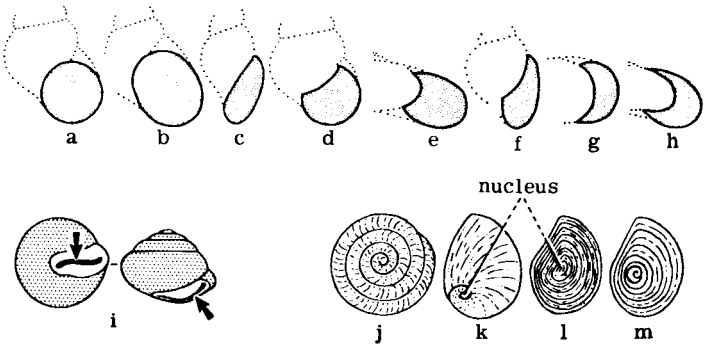
Shell terminology and surface sculpture. a, Striae (indented spiral lines) (a), lirae (raised spiral lines) (b); ribs (raised transverse lines) (c); wrinkles (d); puncta or pits (e); papillae or granules (f); hairs or bristles (g); dents (malleated) (h). b, Transverse or growth lines (a); spiral lines or striae (b).



Shell terminology. a, Shell with whorls increasing gradually in size; b, sutures slightly indented; c, sutures strongly indented; d, crenulate sutures; e, whorls rapidly increasing in size; f, flattened whorl; g, shouldered whorl; h, moderately shouldered whorl; i, rounded whorl; j, sunken spire; k, last whorl not descending in front, i.e., not deflected; l, last whorl descending in front, i.e., deflected; m, globose shell; n, depressed shell; o, strongly depressed shell; p, discoidal shell; q, doubly carinate periphery; r, carinate periphery; s, angular periphery; t, round periphery; u, dextrally (to the right) whorled shell; v, sinistrally (to the left) whorled shell.



Shell terminology. a, Umbilicate shell; b, perforate shell; c, imperforate shell; d, method of measuring shell and umbilicus diameters; e, method of counting whorls; f, straight outer lip; g, curved outer lip; h, lip retracted to the suture; i, truncate columella; j, straight columella; k, straight (not reflected) lip; l, reflected lip.



Shell terminology. a, Round aperture; b, oval aperture; c, narrowly oval aperture; d, roundly lunate aperture; e, ovate-lunate aperture; f, narrowly ovate-lunate aperture; g, broadly lunate aperture; h, deeply lunate aperture; i, narrow slit-like aperture; j, multispiral operculum; k, paucispiral operculum; l, concentric operculum; m, concentric operculum with spiral nucleus.

Anatomy of a Slug

DESCRIPTION

11 to 15 mm in diameter with 5-5.5 whorls that are smooth at first, but then develop into closely-set, round-topped whorls with collabral ribs. The ribs extend from suture to umbilicus and the tops are cut by fine incised spiral striae. The body whorl is rather closely coiled and not markedly descending to the aperture. The spire is flat or barely elevated, and the sutures are moderately impressed and crenulated. The aperture is oblique and semicircular to triangular in basal view. The lip is weakly turned outward with a narrow, crustose border, and the upper lip is strongly depressed so that the margin is sinuate. The shell is translucent to opaque, and the periostracum is an orange-brown color.

RANGE

Trinity and Shasta Counties, California. Also known in Klamath Mountains, California on the Six Rivers and Klamath National Forests. A larger form, subspecies *Ancotrema voyanum humboltense* (to 17 mm diameter and 8 mm high) has stronger, more coarse striations and is found in Humbolt County, CA.

HABITAT

Near streams or intermittent stream channels where substrate is permanently damp. Late successional conditions such as coarse woody debris, riparian hardwood trees, deep leaf mold, and a relatively closed forest canopy provide suitable habitat conditions. This species appears to be associated with limestone substrates mostly within an elevation range of 168-960 meters.

SIMILAR SPECIES

Ancotrema sportella

J.S. Applegarth

Figure 1a. *Ancotrema voyanum*

J.S. Applegarth

Figure 1b. *Ancotrema voyanum* (three specimens). Note triangular aperture shape.

Figure 1c. *Ancotrema sportella.* May be larger (12 to 22 mm diameter in 5 1/4 to 6 1/3 whorls) than *A. voyanum*, and the incised spiral lines are much deeper, creating a beaded texture. The lip of *A. sportella* is much less deflected, and the sinuosity is distinctly less acute with an indented crease running obliquely back from the center of the palatal margin toward the outer edge.

DESCRIPTION

20 to 25 mm in diameter with 5.5-6.0 whorls. The depressed globose-shaped shell has a heavy, broadly reflected apertural lip which partially or mostly covers the umbilicus. The narrow umbilicus is one-eighth to one-tenth the diameter of the shell. *Cryptomastix* are generally hairless as adults (except *Cryptomastix germana*). Immature *C. devia* have short, hooked microscopic bristles on the dorsal surface which are lost by adulthood and are soon lost on preserved shells. The umber-snuff brown surface is somewhat glossy or semi-matte, with irregular, shallow spiral striae which appear as wavy lines under the microscope. Adult specimens have a white, blunt 'tooth' located on the parietal wall of the aperture and a thickening on the lower lip with a low cusp on its outer end. The animal is usually light brown, sometimes with a lilac undertone.

This description best fits western Cascade lots. A few lots from the Columbia Gorge area have a narrower, brown lip, lighter periostracum, more depressed spire, thinner shell, and nearly smooth shell surface.

RANGE

Found in the western Cascade Range and Puget Trough from southern Vancouver Island, B.C. through western Washington to the Oregon side of the Columbia Gorge. Oregon: Multnomah and Wasco Counties. Washington: Clark, Cowlitz, King, Lewis, Pierce, Skamania, and Thurston Counties.

HABITAT

Mature to late successional moist forest and riparian zones, under logs, in leaf litter, around seeps and springs, and often associated with hardwood debris and leaf litter and/or talus. It is often found under or near big-leaf maple and may be under sword-fern growing under these trees, or on the underside of big-leaf maple logs. Canopy cover is generally high. Low to mid-elevations. Young individuals may be found under mosses growing on the trunks of big-leaf maple.

SIMILAR SPECIES

Allogona ptycophora
Allogona townsendiana
Cryptomastix hendersoni

T. Burke

Figure 2a. *Cryptomastix devia*

T. Burke

Figure 2b. *Cryptomastix devia*

Figure 2c. *Allogona townsendiana* (left) and *Allogona ptycophora* (right) lack apertural teeth.

Figure 2d. *Cryptomastix hendersoni*. Smaller (15-20 mm diameter) than *C. devia*, usually with no parietal tooth, or occasionally a very small parietal tooth.

DESCRIPTION

15 to 20 mm in diameter with 5.0-5.5 whorls. The spire is moderately depressed, and the suture is slightly impressed. The initial whorls are smooth or slightly granular. There is no trace of hairs, papillae, or hair scars on the succeeding whorls. The aperture is moderately oblique. The lip is typically white to light brown, narrowly reflected except at the base, and barely covers the umbilicus. The umbilicus is shallow and small, about one-tenth the shell's diameter. The shell is semi-transparent with the periostracum a dilute-snuff brown or yellow-brown color. The surface is generally somewhat glossy. The animal is a light-tan color with pinkish undertones.

RANGE

Oregon: Columbia River Gorge, Wasco and Sherman Counties. Washington: Skamania and Klickitat Counties. Its range may extend north into Yakima County, Washington.

HABITAT

Generally within 100 meters of streams, seeps, and springs. It may be a riparian associate in steppe communities at low to mid-elevations and may be found among moist talus, leaf litter and shrubs, or under logs and other debris.

SIMILAR SPECIES

Allogona ptycophora
Allogona townsendiana
Cryptomastix devia

J.S. Applegarth

Figure 3a. *Cryptomastix hendersoni*

T. Burke

Figure 3b. *Cryptomastix hendersoni*

T. Burke

Figure 3c. *Cryptomastix hendersoni*

Figure 3d. *Allogona townsendiana* (left) is larger (25.5 mm diameter), rougher in appearance, and the whorls are not as tight as in *C. hendersoni*. *Allogona ptycophora* (right) may be equal to or slightly larger (up to 22 mm diameter) than *C. hendersoni* in size, and color varies from gray to dark brown. Also, the spire is higher and more acute in *A. ptycophora*, and there is no apparent constriction before the reflected lip margin.

Figure 3e. *Cryptomastix devia.* Larger (20-25 mm diameter) than *C. hendersoni* with a well-developed parietal tooth and an umbilicus which is usually at least half-covered by the reflected lip margin.

DESCRIPTION

18 to 28 mm in diameter with 5.0-5.7 whorls. The shell is rather globose in shape, very thin and delicate, and pinkish-tan under a straw-colored periostracum. A reddish shoulder band is present with a narrow band of a lighter shade below. The spire is broadly conic. The lip is thickened and only reflected over the umbilicus, which is half covered. Embryonic whorls are smooth and swollen. Post-embryonic whorls have rather coarse growth ridges with light malleation and no spiral striae. The body whorl has rather coarse growth lines on the shoulder but is nearly smooth below the periphery.

RANGE

Klamath Province, including Jackson County (OR), on or near BLM Medford District land, and Siskiyou County (CA), with Shasta River sites on or adjacent to BLM land and near the eastern border of the Klamath National Forest. It may also be found as far north as Douglas County, Oregon.

HABITAT

Generally associated with, though not restricted to talus and other rocky substrates. It is suspected to be found within its range wherever permanent ground cover and/or moisture is available. This may include rock fissures or large woody debris sites. This species is also adapted to somewhat dry conditions during a portion of the year.

SIMILAR SPECIES

There is a geographically defined population of *H. hertleini* found from southern Douglas County, OR south into Northern California. Within and adjacent to this region, there are also similar undescribed species.

Helminthoglypta talmadgei

Figure 4a. *Helminthoglypta hertleini*

Figure 4b. *Helminthoglypta hertleini*

C. Telford

Figure 4c. *Helminthoglypta talmadgei* (left) has a subtle pattern of fine malleations on the shell surface when compared to *H. hertleini (right)*. This feature is especially evident on the shoulder, and is best viewed under magnification.

DESCRIPTION

18 to 28 mm in diameter with 5.2-6.1 whorls which are somewhat flattened. The spire is broadly conic, and the suture is moderately impressed. The post-embryonic sculpture is of coarse growth lines, incised from the fourth whorl on by fine spiral striae and disrupted by irregular malleation. The body whorl has a matte appearance due to malleations, especially on the shoulder. The aperture is broadly ear-shaped. The lip is turned outward and thickened. The inner lip covers less than half of the umbilicus. The shell is a pale pinkish-tan color under a golden brown periostracum. The surface may be matte to silky. The animal is pale tan.

RANGE

Trinity and Humboldt Counties, California. Also known in Klamath National Forest.

HABITAT

Stable talus and rockslides in limestone substrates, especially near springs or streams. Trees and bushes appear to be important for shading and food, though deep shade is not necessary.

SIMILAR SPECIES

Helminthoglypta hertleini

Figure 5a. *Helminthoglypta talmadgei*

Figure 5b. *Helminthoglypta talmadgei*

Figure 5c. *Helminthoglypta talmadgei*

Figure 5d. *Helminthoglypta hertleini* (right) lacks the subtle pattern of fine malleations on the shell surface when compared to *H. talmadgei* (left). Also, *H. hertleini* is smoother in appearance and has fewer whorls.

DESCRIPTION

15 to 20 mm in diameter with up to 6.0 whorls in adults. The distinguishing features of this species include the tight spiral pattern formed by consecutive whorls and the translucent, pearly appearance of the shell. The shell is smooth, moderately thin, has no spiral grooves, and is almost discoidal in shape with a slightly raised spire. The periphery of the aperture is rounded and the basal margin of the aperture is somewhat flattened when compared to the Haplotremes. Also, the aperture is on the same plane as the whorls or very slightly offset below. The periostracum is relatively transparent and slightly amber-tinted in live specimens. The umbilicus is moderately large in diameter, occupying about a third of the shell's diameter. Neither adult nor juvenile snails have a reflected apertural lip.

RANGE

Known from the Puget Trough of western Washington through the Willamette Valley, Cascade Range foothills, and coast range of Oregon. Oregon: Benton, Clackamas, Clatsop, Coos, Douglas, Lane, Marion, Multnomah, and Tillamook Counties. Washington: Cowlitz, Grays Harbor, Lewis, and Thurston Counties.

HABITAT

In moist conifer/hardwood forests up to 915 meters. A big-leaf maple component and an abundance of sword-fern on forested slopes and terraces seem characteristic. This species is somewhat photophobic, preferring a moist habitat under forest litter, and is seldom found active on the surface. Typically, it is associated with big-leaf maple litter and is commonly found between layers of partially decomposed leaves.

SIMILAR SPECIES

Ancotrema sportella
Haplotrema vancouverense

J.S. Applegarth

Figure 6a. *Megomphix hemphilli*

N. Duncan

Figure 6b. *Ancotrema sportella* (left), *Megomphix hemphilli* (center), and *Haplotrema vancouverense* (right). *M. hemphilli* appears to be more tightly coiled in comparison to the other two, a feature most apparent towards the outer whorls.

J.S. Applegarth

Figure 6c. *H. vancouverense* (right) is larger and has a moderately depressed and more oval-shaped aperture in comparison with *M. hemphilli* (left).

T. Burke

Figure 6d. *Ancotrema sportella.* The shell surface has spiral grooves perpendicular to the radial growth lines, forming a fine beaded texture and a non-reflective surface in comparison to the shiny appearance of *Megomphix* shells . This pattern may be obvious only around the umbilicus.

T. Burke

Figure 6e. The shell surface of *H. vancouverense* lacks the strong spiral grooves which form the beaded texture in *A. sportella.* Very fine microscopic spiral striae are distinct, but may be visible only with a 10x or greater hand lens. Though somewhat shiny in appearance, *H. vancouverense* is less shiny than *M. hemphilli* and is more greenish in color. A whitish coloring around microscopic pits or other shell injuries is more conspicuous in *M. hemphilli* than in *Haplotrema* species.

DESCRIPTION

18 to 26 mm in diameter with 5.2-5.8 whorls and a low-spire. The ground color is yellowish with a reddish-brown base. The peripheral band color is usually dark reddish-brown, bordered by a lighter brown shoulder stripe. The first two embryonic whorls have a fine granular texture grading into microscopic wrinkles which are parallel to the growth lines. Body whorls have irregular low rugae and fine, wavy incised spiral striations. The last portion of the body whorl behind the aperture is deflected downward, and the lip is moderately reflected, especially at the base. The umbilicus is less than a quarter covered by the reflected lip. The periostracum is smooth and lustrous with a glossy appearance.

RANGE

Known from Siskiyou County, California. Range extension expected to extend to Jackson and Josephine Counties, Oregon.

HABITAT

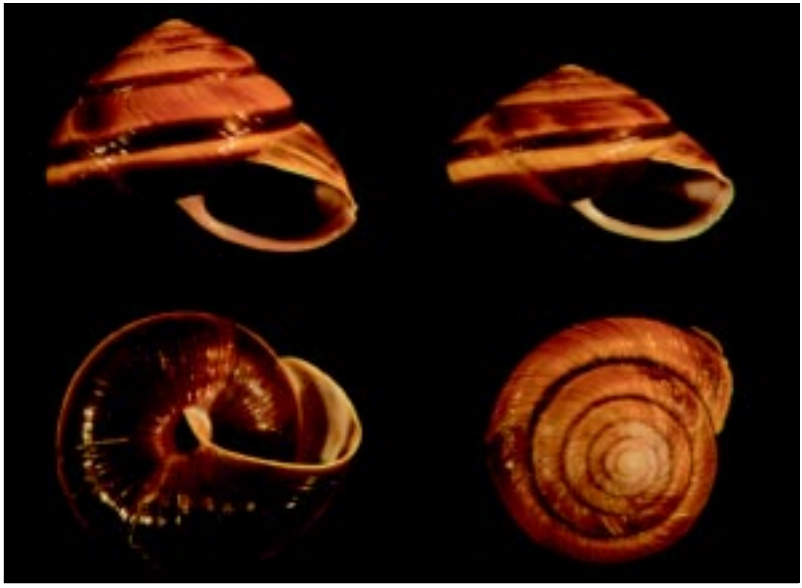
Lower reaches of major drainages, in talus and rock slides, under rocks and woody debris in moist conifer forests, in caves, and in shrubby areas in riparian corridors. Rocks and large woody debris serve as refugia during the summer and late winter seasons.

SIMILAR SPECIES

Monadenia scottiana
Monadenia fidelis fidelis
Monadenia fidelis leonina
Monadenia churchi

Figure 7a. *Monadenia chaceana*

Figure 7b. *Monadenia churchi*. In comparison to the larger *M. chaceana*, the umbilicus is slightly less covered by the reflected lip and the overall appearance is duller and more matte-like, especially at the basal area. Also, the post-embryonic sculpture of *M. churchi* contains distinctive regularly-spaced, elongated, raised tubercles arranged in spiral order.



T. Pearce

Figure 7c. *Monadenia fidelis fidelis.* Umbilicus is half-covered by the reflected lip and the peripheral band and basal patch is blackish-brown.

N. Duncan

Figure 7d. *Monadenia scottiana.* Shiny, but not extremely glossy, this species has a more prominent band and a darker background color than *M. churchi*. *M. scottiana* also lacks incised spiral striations and papillae on the post-embryonic whorls. Found only around streams tributary to the Scott River Ca., though one outlier from the Mad River district is known.

N. Duncan

Figure 7e. *Monadenia fidelis leonina.* The shell surface has a more rugose texture compared to the overall smooth appearance of *M. chaceana.*

Monadenia churchi Klamath or Church's Sideband

DESCRIPTION

17.8 to 23.5 mm in diameter with 5-6 whorls. The spire is low-conic to moderately raised with straight or weakly convex sides. Embryonic whorls 1.6-1.9 have fine granules arranged in diagonal rows. The post-embryonic sculpture contains distinctive regularly-spaced, elongated, raised tubercles arranged in spiral order. The thick, reflected lip is turned outward and is thickened by callus. The inner lip impinges slightly on the umbilicus. The umbilicus is contained about 9 times in the diameter of the shell. The spire, shoulder, and base are reddish-brown (or rarely tan), with single or double, narrow stripes. The periostracum is smooth, matte or silky, and light yellowish tan in color. The animal is tan or blackish with cream or salmon-colored tubercles and a light mid-dorsal stripe.

RANGE

California counties: Butte, Humboldt, Shasta, Siskiyou, Tehama, and Trinity.

HABITAT

Limestone outcrops, caves, talus slides, and lava rockslides, especially in riparian areas and under nearby forest debris in heavy shade. Many sites around Shasta Lake are in brush and pine-oak woodland.

SIMILAR SPECIES

Monadenia chaceana
Monadenia troglodytes troglodytes
Monadenia scottiana

Figure 8a. *Monadenia churchi*

Figure 8b. *Monadenia troglodytes troglodytes.* Shell surface has a glossier appearance and is lighter in color compared to *M. churchi.*

Figure 8c. *Monadenia chaceana.* The umbilicus is slightly more covered by the reflected lip, and the appearance of the shell is glossier than in *M. churchi*, especially at the basal area. Also, raised sculpture on the early post-embryonic whorls is weaker and less regularly arranged.

Figure 8d. *Monadenia scottiana*. Shiny, but not extremely glossy, this species has a more prominent band and a darker background color than *M. churchi*. Also, *M. scottiana* has a gray body and lacks incised spiral striations and papillae on the post-embryonic whorls. Found only around streams tributary to the Scott River, Ca., though one outlier from the Mad River district is known.

DESCRIPTION

27.4 to 33.2 mm in diameter with about 6.25 whorls. Umbilicus is steep-walled and about one-twelfth to one-fourteenth the diameter of the shell. Aperture is ovate and somewhat flattened below. The surface of the shell's main portion is smooth and polished with very finely incised microscopic spiral striation. The ground color is dark brown with a tri-colored band bordering the periphery. The dark central stripe is about 2.5 mm thick and resembles the color of the shell's base. The dark-yellow stripe below is about 1.5 mm thick, and the lighter uppermost band is even narrower.

RANGE

Known from Siskiyou and Humboldt Counties, California. Range may extend as far north as Josephine County, Oregon, but not east of the Sacramento River Basin or into coastal areas.

HABITAT

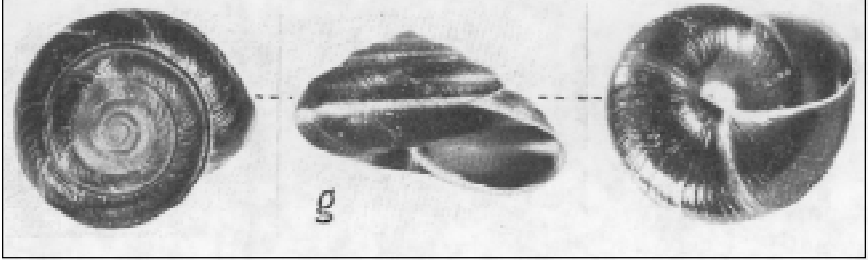
Stable riparian zones within semi-dry mixed deciduous and conifer forests, but not necessarily restricted to riparian zones. Late successional forest with high canopy closure, a mixed conifer and hardwood component, and the presence of large, down woody debris or rock talus is considered optimum habitat. This species has been found under logs, in rocky areas, and on pine needle and oak leaf litter.

SIMILAR SPECIES

In the southern part of its range, *Monadenia fidelis*, which is elsewhere relatively uniform in morphology, tends to form distinctive local geographic races. These races are listed below.

Monadenia fidelis ochromphalus
Monadenia fidelis leonina
Monadenia fidelis salmonensis

sculpture (n.) The natural surface markings on snail shells.



California Academy of Science

Figure 9a. M*onadenia fidelis klamathica*. Photo from Henry A. Pilsbury's Land Mollusca of North America (Philadelphia Academy of Natural Sciences Monograph #3, 1939).

N. Duncan

Figure 9b. *Monadenia fidelis leonina*. Smaller and paler than *M. f. klamathica* with a more rugose texture. Many specimens are pale yellowish, even at the base.

J.L. Furnish

Figure 9c. *Monadenia fidelis ochramphalus.* The area around the umbilicus is yellow, rather than blackish-brown as with *M. f. klamathica*. *Monadenia fidelis salmonensis* (no photo) from areas along the Salmon River, CA is also very similar to *M. f. klamathica*, but has radial streaks of yellow on the base. Also, *M. f. salmonensis* appears glossy only on the base, in comparison to the overall glossy appearance of *M. f. klamathica.*

DESCRIPTION

20 to 25 mm in diameter with 5.5-6.0 whorls at maturity. The rough shell has sharp growth lines and is a yellowish-brown color with a chestnut-colored base. Peripheral band is yellowish with a wider, dark brown supraperipheral band and another narrower, less distinct yellowish band above. The dorsal color is diffuse yellowish or grayish brown. The lip is thin and slightly reflected, covering little of the umbilicus. The spire is low, nearly conic. The live animal has a gray-brown body with bluish pigment granules.

RANGE

Known from the central and eastern Columbia Gorge of Washington and Oregon, and up the Deschutes River as far as 50 miles from its mouth. This species has been found in Wasco County, Oregon and Klickitat County, Washington.

HABITAT

Associated with talus habitat and moist rocky areas, especially around seeps and springs, in steppe or dry forest plant communities. However, it is not found in the springs or seeps, nor is it considered to be a talus obligate. Rocks and large woody debris serve as refugia during the summer and late winter seasons.

SIMILAR SPECIES

Monadenia fidelis fidelis

J.L. Furnish

Figure 10a. *Monadenia fidelis minor*

T. Burke

Figure 10b. *Monadenia fidelis fidelis* (below) is larger in comparison to *M. f. minor* (above), and the last whorl may be more sharply deflected before the aperture, though this is not always the case. Juveniles of *M. f. fidelis* may be similar in size to *M. f. minor*, but will have an angled periphery and lack the reflected lip.

Monadenia fidelis ochromphalus Yellow-based Sideband

DESCRIPTION

29.6 to 32.7 mm in diameter with 6.5 whorls. The shell is highly polished with a very fine spiral sculpture, especially on the base. The base is a lustrous blackish umber, with yellow on the area immediately surrounding the umbilicus. The umbilicus is open and permeable to the apex and one-third covered by the reflected lip. The shell color is dark with a wide peripheral band of dark umber bordered below by a narrow buff-colored band.
This species is considered in the Northwest Forest Plan under the section for protection from grazing. It is also a riparian assessment species. Although not required for survey prior to activities, the plan does suggest that it be protected.

RANGE

Known from Siskiyou and Humboldt Counties, California. Range may extend as far north as Josephine County, Oregon, and possibly east of the Sacramento River Basin.

HABITAT

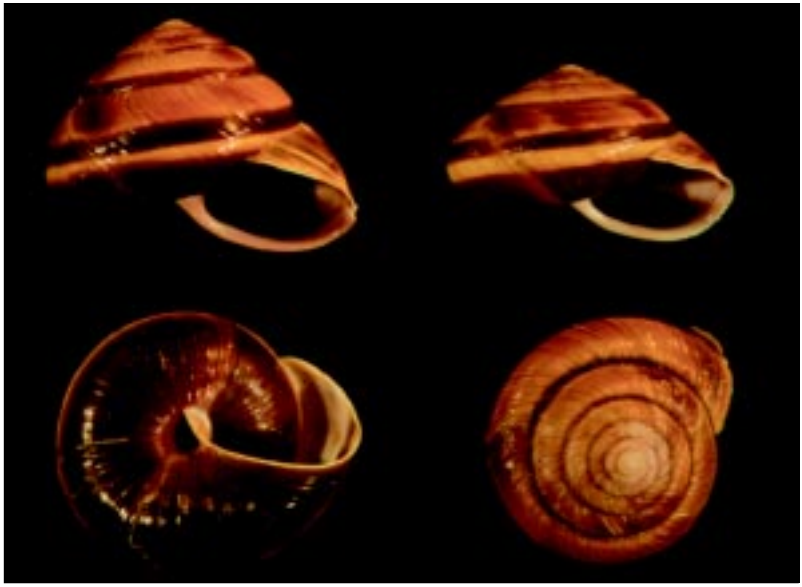
Stable riparian zones within semi-dry mixed deciduous and conifer forests, but not necessarily restricted to riparian zones. Late successional forest with high canopy closure, a mixed conifer and hardwood component, and the presence of large, down woody debris or rock talus is considered optimum habitat. This species has been found under logs, in rocky areas, and on pine needle and oak leaf litter.

SIMILAR SPECIES

Monadenia fidelis fidelis
Monadenia fidelis klamathica
Monadenia fidelis salmonensis

J.L. Furnish

Figure 11a. *Monadenia fidelis ochramphalus*



T. Pearce

Figure 11b. *Monadenia fidelis fidelis* (above) is larger with a higher and more conic spire compared to *M. f. ochramphalus*. Also, the shell lacks the yellow center at the base and the appearance of a polished surface. *Monadenia fidelis salmonensis* (no photo) from areas along the Salmon River, CA is also very similar to *M. f. ochramphalus*, but has radial streaks of yellow on the base rather than the solid yellow umbilical patch. Also, *M. f. salmonensis* appears glossy only on the base, in comparison to the overall glossy appearance of *M. f. ochramphalus*. Another similar species *Monadenia fidelis klamathica* (no photo) lacks the yellow center on the base.

DESCRIPTION

20.5 to 29.0 mm in diameter with 5-6 whorls. The ground color is white or light tan with a reddish-brown peripheral band. The periostracum is smooth and colorless or a light yellow-tan. The depressed shell has a somewhat flattened profile. The whorls are somewhat flattened, and the sutures are weakly indented. The periphery is broadly rounded. The aperture is broadly ear-shaped and oblique. The lip is turned outward, reflected, and thickened by callus. The inner lip impinges slightly on the umbilicus. The umbilicus is contained 5-11 times in diameter. Embryonic shell sculpture is granular, grading into fine wavy radial lines. The post-embryonic whorls have increasingly sparse papillation, disappearing by the third or fourth whorl. The body whorl is characterized by fine, parallel, incised growth lines which can be somewhat wavy and are most obvious just behind the apertural lip. The animal is gray to sooty black with a reddish or purplish cast and a light dorsal stripe.

RANGE

Known only from Shasta County, California along the McCloud River arm and near the Pit River arm of Shasta Lake.

HABITAT

Limestone areas, including caves, talus slopes, and other rocky areas which are open, brush-covered, or associated with pine-oak woodlands. Refuge sites do not need to have vegetative cover.

SIMILAR SPECIES

Monadenia troglodytes wintu

J.L. Furnish

Figure 12a. *Monadenia troglodytes troglodytes*

N. Duncan

Figure 12b. *Monadenia troglodytes wintu*. On average, larger and higher-spired when compared with *M. t. troglodytes.* Also, shell is thicker, more opaque and more highly colored (the difference in color is best viewed on a white background). Underside is pale for both subspecies.

DESCRIPTION

20.5 to 29.0 mm in diameter with 5-6 whorls. The ground color is white or light tan with a bright reddish-brown peripheral band bordered by whitish bands. The periostracum is smooth and colorless or a light yellow-tan color. The depressed shell has a somewhat flattened profile. The whorls are somewhat flattened, and the sutures are weakly indented. The periphery is broadly rounded. The aperture is broadly ear-shaped and oblique. The lip is turned outward, reflected, and thickened by callus. The inner lip impinges slightly on the umbilicus. The umbilicus is contained 5-11 times in diameter. Embryonic shell sculpture is granular, grading into fine wavy radial lines. The post-embryonic whorls have increasingly sparse papillation, disappearing by the third or fourth whorl. The body whorl is characterized by fine, parallel, incised growth lines which can be somewhat wavy and are most obvious just behind the apertural lip. The animal is gray to sooty black with a reddish or purplish cast and a light dorsal stripe.

RANGE

Known from Shasta County, California along the Pit River arm of Shasta Lake over to Squaw Creek and at Mountain Gate.

HABITAT

Limestone areas, including caves, talus slopes, and other rocky areas which are open, brush-covered, or associated with pine-oak woodlands. Refuge sites do not need to have vegetative cover.

SIMILAR SPECIES

Monadenia troglodytes troglodytes

Figure 13a *Monadenia troglodytes wintu*

J.L. Furnish

Figure 13b. *Monadenia troglodytes troglodytes.* On average, smaller and lower-spired when compared with *M. t. wintu.* Also, shell is thinner, less opaque and less colorful (the difference in color is best viewed on a white background). Underside is pale for both subspecies.

DESCRIPTION

Up to 18 mm in diameter with up to 4.5 whorls. The conic-shaped spire is moderately tall. The shell is a dirty white color with two well-developed, brown bands. The periphery is rounded. The embryonic shell surface has radial striae, moderately even throughout. There are weak periostracal lirations on both surfaces of all whorls. The aperture is rounded, not considerably thickened, and only slightly oblique. The lip is not reflected or expanded. The parietal callus is very thin. The umbilicus is moderate in size and about one-quarter of the shell's diameter.

RANGE

Known only from northeastern Chelan County, Washington. It is also suspected to occur in parts of Okanogan County, WA.

HABITAT

Preferred habitat is not well-defined. It was originally found in "schist talus" above the southwest shore of Lake Chelan. However, shells have been found at several sites with no apparent talus. Sites are near ridgetops, often in small draws, benches or depressions, and in open Ponderosa pine or Douglas-fir forest edge with ground cover of pinegrass (*Calamagrostis rubescens*) or elk sedge (*Carex geyeri*).

SIMILAR SPECIES

Oreohelix junii
Oreohelix strigosa
Undescribed new species

Figure 14a. *Oreohelix new species 1*

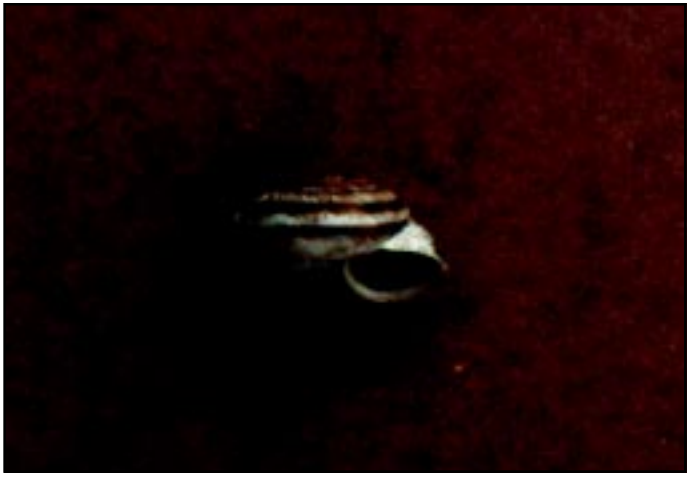


Figure 14b. Mad River Mountainsnail, another undescribed *Oreohelix* species (under review) has a lower spire and prominent, sharp growth wrinkles.

Figure 14c. *Oreohelix junii* (below). Similar to *O. new species 1*, but has a very low spire. *O. strigosa* (above) is larger than *O. n. sp. 1*, and shells of immatures have a strongly angular periphery.

DESCRIPTION

Up to 2.75 mm in diameter and 1.5 mm in height. Specimens are best viewed under a dissecting microscope. The shell has a rounded periphery with the widest point at about mid-whorl. This species has a low conic spire with 5.5-6.0 whorls which are closely coiled. The shell has no umbilicus (imperforate). The aperture is crescent-shaped and is somewhat flattened on the base when compared to *Pristiloma arcticum arcticum*. The lip is thickened and reflected only where it meets the columella. The outer and basal margins of the lip are thin. The peripheral region and base are smooth except for very weak lines of growth. Very fine, close spiral lines are seen on the upper surface. The live shell is pinkish-buff in color, smooth, and very glossy.

RANGE

Known from south of Crater Lake, Klamath County, Oregon. There has also been an occurrence in Jefferson County, Oregon. Federal lands include Crater Lake National Park and the Deschutes National Forest. This species is also suspected to occur on the Winema, Umpqua, and Willamette National Forests and parts of BLM districts adjacent to these forests east of Interstate 5. It may occur throughout the Oregon Cascades in widely scattered populations.

HABITAT

Above 610 meters elevation in moist conifer forests and among mosses and other vegetation near wetlands, springs, seeps, and riparian areas. Specimens may be found on logs, among sedges, attached to decaying leaf surfaces, in litter, or inside other shells.

SIMILAR SPECIES

Pristiloma articum arcticum
Pristiloma lansingi
Other *Pristiloma* species

Figure 15a. *Pristiloma arcticum crateris*. Periphery of last whorl is more rounded than in other imperforate *Pristiloma* species. *P. a. arcticum* (no photo) found from Washington is very similar, but the base of *P. a.. crateris* is more flattened, producing a less deeply concave basal lip and a somewhat different aperture shape.

Figure 15b. *Pristiloma arcticum crateris*

Figure 15c. *Pristiloma arcticum crateris*

Figure 15d. *Pristiloma lansingi*. Periphery of the largest whorl has a shouldered appearance, and an irregularly toothed rib is present within the outer margin of the apertural lip (unique to this *Pristiloma* species).

DESCRIPTION

About 8 mm in diameter with 5.8-6.2 tightly-coiled whorls. The shell is depressed and discoidal. The spire is almost flat, and the suture is impressed. The overall shell color of a live specimen is reddish-brown. The periostracum bears short, erect, well-spaced bristles when not eroded. The umbilicus is wide, contained about 4.5 times in the diameter of the shell. The pinkish-tan lip is gradually turned outward, deeply reflected on the outer and basal margins, and has three teeth within the aperture. The parietal tooth is long and high, the basal tooth is thick and rounded, and the outer tooth is thick and square topped. The shell sculpture, seen under magnification, shows a pattern of long granules along the radial growth lines and microscopic spiral lines. The embryonic whorls are smooth. On the last body whorl, erect short hairs can be seen in parallel rows following the growth lines in protected places. The mantle is spotted with black.

RANGE

An endemic species of Shasta County, California.

HABITAT

May be found within 100 meters of lightly to deeply shaded limestone rockslides, draws, or caves with a cover of shrubs or oak.

SIMILAR SPECIES

Trilobopsis loricata
Trilobopsis tehemana
Cryptomastix germana

Figure 16a. *Trilobopsis roperi*

Figure 16b. *Trilobopsis roperi*

Figure 16c. *Trilobopsis tehemana*. Smaller than *T. roperi* with a slightly more elevated spire and a narrower umbilicus. Sculpturing is formed by growth wrinkles with weak spiral striae in places.

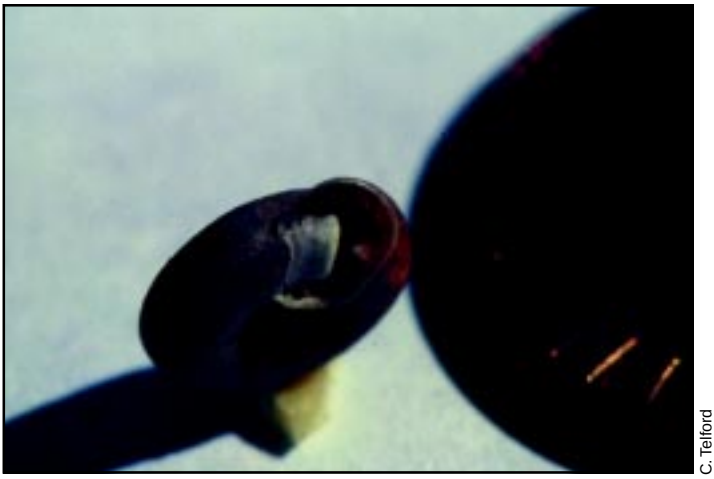


Figure 16d. *Trilobopsis tehemana*. Reflected apertural lip is angled sharply at 90 degrees, rather than turned gradually outward. *Trilobopsis loricata* (no photo) is smaller than *T. roperi* with a more elevated spire, a smaller umbilicus, and sculpture formed by crescent-shaped scales. *Cryptomastix germana* (no photo) is imperforate or the umbilicus is very small and partly closed by the reflected lip margin. Also, the spire is higher than in *T. roperi* or *T. tehemana*, and only a single parietal tooth is present.

DESCRIPTION

About 7 mm in diameter with 5.4-5.5 tightly-coiled whorls. The shell is depressed, nearly discoidal. The spire is nearly flat, and the suture is impressed. The embryonic whorls are smooth. The shell color is cinnamon brown with a matte surface due to a fine pattern of radial wrinkles and weak spiral lines. The periostracum bears minute, sparse bristles (usually lost by abrasion) and low papillae. The umbilicus is moderately wide and is contained five times in the shell diameter. Within the umbilicus, coarse papillae are present. The lip is pinkish tan in color, sharply turned outward, and deeply reflected. The aperture is small, triangular and contains three teeth: a long, high parietal tooth; a tubercular tooth on the basal margin; and a square tooth on the outer lip. The mantle is spotted with black.

RANGE

An endemic species of Tehama, Butte, and Siskiyou Counties, California.

HABITAT

Usually associated with rocky talus. This species has also been found under leaf litter and woody debris on the ground within 100 meters of limestone outcrops.

SIMILAR SPECIES

Trilobopsis roperi
Trilobopsis loricata
Cryptomastix germana

Figure 17a. *Trilobopsis tehamana*

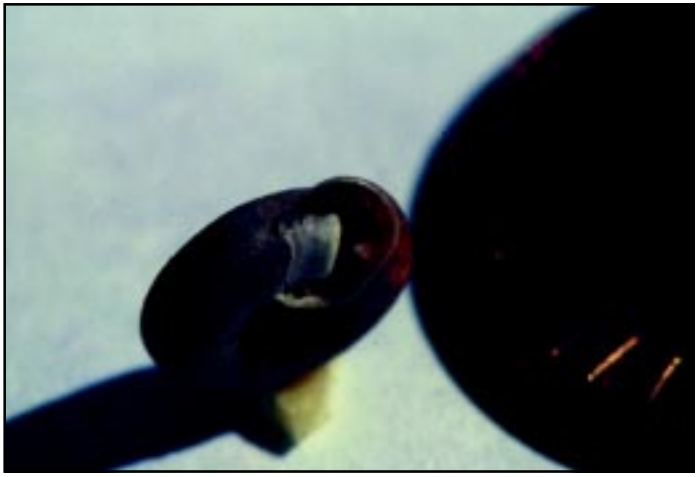


Figure 17b. *Trilobopsis tehamana*

Figure 17c. *Trilobopsis roperi*. Larger, with a rougher shell sculpture than *T. tehamana.*

Figure 17d. *Trilobopsis roperi*. Reflected apertural lip is turned gradually outward, rather than angled sharply at 90 degrees . *Trilobopsis loricata* (no photo) is smaller than *T. tehemana* with a more elevated spire, a smaller umbilicus, and sculpture formed by crescent-shaped scales. *Cryptomastix germana* (no photo) is imperforate or the umbilicus is very small and partly closed by the reflected lip margin. Also, the spire is higher than in *T. roperi* or *T. tehemana*, and only a single parietal tooth is present.

DESCRIPTION

Less than 3 mm in length with 7-9 whorls. This snail has a distinct beehive shape. The shell surface is relatively smooth and somewhat glossy. The single parietal apertural tooth is fairly prominent. The short, multiple palatal and basal teeth are fused into one wide tooth in fully adult specimens. The umbilicus is large and open. The aperture is distinctly flared with a barely reflected lip. The middle whorls are wider than the final whorl. Positive identification of this species requires fully adult specimens.

RANGE

Known only from the Hoko River drainage on the Olympic Peninsula, Clallam County, Washington. It is expected to be found on federal lands in the Olympic National Forest and Olympic National Park.

HABITAT

Arboreal and considered an old-growth forest and riparian species. It may be found on the smooth trunks and lower limbs of deciduous trees and shrubs, or in leaf litter under such vegetation within 200 meters of streams, seeps, or springs. This snail typically hangs upside down from limbs and trunks of trees and shrubs with smooth bark, where it may appear to be a small bud.

SIMILAR SPECIES

Vertigo colombiana

T. Burke

Figure 18a. *Vertigo new species* (Hoko Vertigo). Note the tapered spire and the smaller cusps connecting the palatal and basal teeth.

Figure 18b. *Vertigo columbiana*. Spire is typically more cylindrical than in Hoko Vertigo, and there are four distinct apertural teeth: parietal, columellar, palatal and basal.

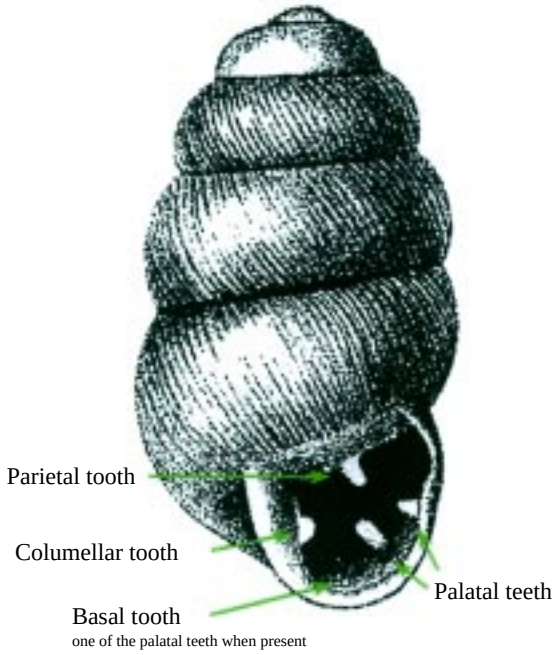


Figure 18c. Arrangement of apertural teeth on *Vertigo* snails.

DESCRIPTION

12.5 to 17.5 mm in diameter with a depressed-helicoid shell and 5.5 - 6.4 whorls. The spire is straight-sided or slightly convex, and the suture is deeply impressed. The first 0.2 embryonic whorl is obscurely granulose. The next 0.8 whorls have papillae in radial rows, succeeded with radiating, sometimes partly papillose wrinkles. This species has sparse, short hairs as a juvenile which are usually lost in adults. The periostracum has a brown color and matte appearance. The white to pinkish-buff colored lip is turned outward and is strongly reflected, but only covering one-quarter of the umbilicus. The umbilicus is contained about 8.5 times in diameter. The aperture is broadly ear-shaped and has no parietal tooth. The live animal is charcoal gray with a pinkish-buff tone.

RANGE

Trinity County, California, within the boundaries of the Shasta-Trinity National Forest, up to 915 meters elevation.

HABITAT

Inhabits forests of conifer and/or hardwood trees in permanently damp areas within 200 meters of seeps, springs, and stable streams.

SIMILAR SPECIES

Vespericola shasta

N. Duncan

Figure 19a. *Vespericola pressleyi*

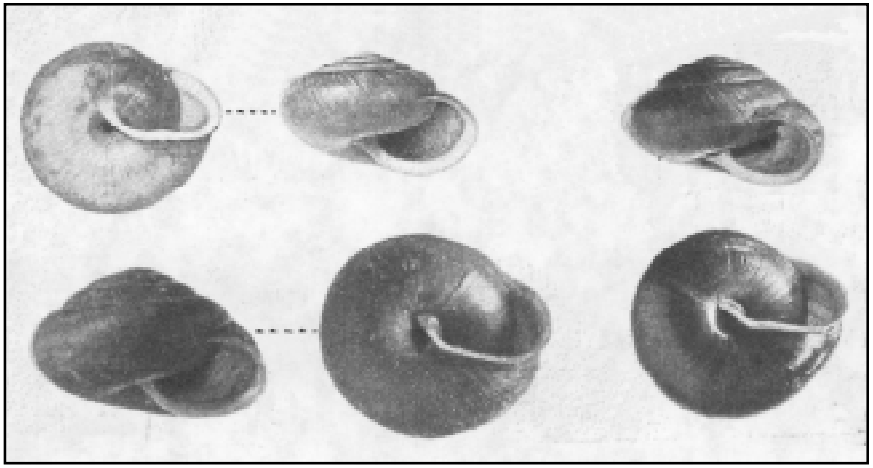


Figure 19b. *Vespericola shasta*. This illustration is from Henry A. Pilsbury's Land Mollusca of North America (Philadelphia Academy of Natural Sciences Monograph #3, 1939). *V. shasta* is smaller than *V. pressleyi*, has a shiny periostracum, and its umbilicus is half-covered.

DESCRIPTION

12.7 to 14.5 mm in diameter with a depressed-helicoid shell and 5.5-6.0 whorls. The spire is straight-sided or weakly convex, and the suture is moderately impressed. The first 0.5 embryonic whorl is irregularly granulose. The periostracum is brown with an olive or pinkish tint and is shiny, especially on the base. Bristles are minute and stubble-like, or absent. The base is tumid and solid-looking. The aperture is broadly ear-shaped. The lip is pinkish buff to whitish in color and is turned outward and thickened within, especially at the base. *V. shasta* have no apertural teeth, and the reflected lip covers approximately half of the umbilicus. The umbilicus is contained about ten times in diameter.

RANGE

Endemic to the Klamath Province, primarily in the vicinity of Shasta Lake, up to 915 meters elevation.

HABITAT

Has been found in moist bottom lands, such as riparian zones, springs, seeps, marshes, and in the mouths of caves.

SIMILAR SPECIES

Vespericola pressleyi

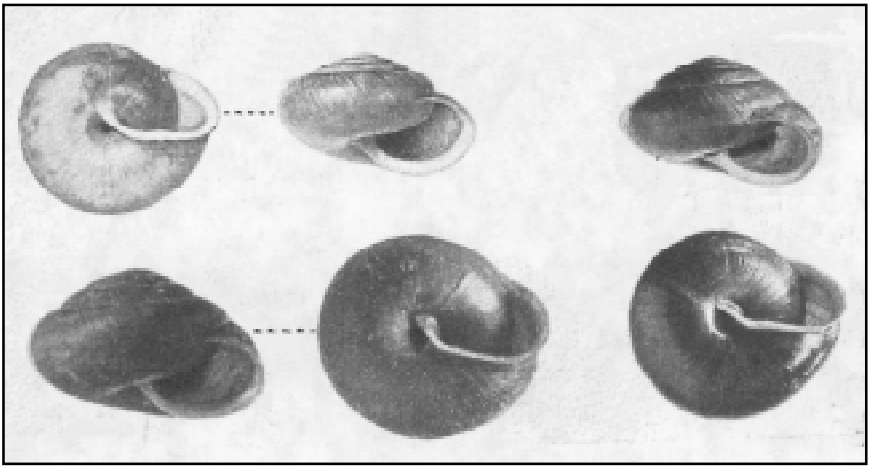


Figure 20a. *Vespericola shasta*. This illustration is from Henry A. Pilsbury's Land Mollusca of North America (Philadelphia Academy of Natural Sciences Monograph #3, 1939).

Figure 20b. *Vespericola pressleyi*. The periostracum has a matte appearance, and the lip covers only one-quarter of the umbilicus.

DESCRIPTION

Length is about 16 mm. The mantle is brown with small, scattered light spots. The flanks are paler below the mantle. Elsewhere, the animal is usually light brown with some slightly darker brown spots. The upper surface of the mantle has weak, closely spaced concentric wrinkles. The back is rounded, except close to the end where it is shortly carinate above. The sole is tripartite with areas of equal width; the middle is slightly darker than the sides.

RANGE

Low to mid-elevations between the western Cascade Range and the Pacific Ocean from northwestern Oregon through western Washington, and on Vancouver Island, B.C. Oregon: Clackamas, Multnomah, and Wasco Counties. Washington: Clallam County.

HABITAT

May be associated with a variety of low vegetation, litter, and debris. Rocks also may be used. Little is known about this species and its habitat.

SIMILAR SPECIES

Deroceras reticulatum
Deroceras laeve

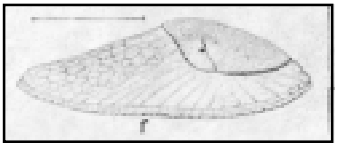


Figure 21a. *Deroceras hesperium*. This illustration from Henry A. Pilsbury's Land Mollusca of North America (Philadelphia Academy of Natural Sciences Monograph #3, 1939) is one of the few illustrations available.

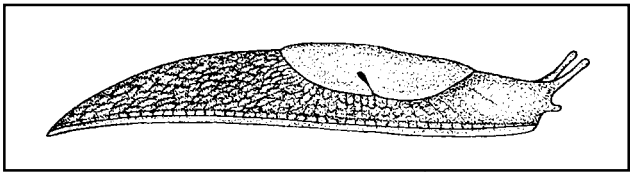


Figure 21b. *Deroceras laeve*. Length may be up to 25mm. While the color is usually quite uniform, it may vary from shades of amber to purple, but sometimes black.

N. Duncan

Figure 21c. *Derocerus reticulatum*. This is a medium-sized slug, rather stout-looking, up to 50 mm in length. The background color is pale gray, cream or flesh-colored with gray flecks on the mantle and darker reticulations elsewhere on the body and sides. The very large mantle has a distinctive pattern of concentric grooves resembling a fingerprint. The center one-third of the sole is darker gray than the whitish outer bands. Tail is slightly keeled at the end. This slug secretes clear slime when crawling, but produces a milky white slime when touched or irritated.

T. Burke

Figure 21d. *Derocerus sp.* The species of this slug is uncertain, though it is very similar to the description of *Derocerus hesperium*. Note the extension of the head in front of the mantle.

DESCRIPTION

Adults range from 13-26 mm in length. A distinct visceral hump is covered by the mantle. The shell plate is visible through a slit in the back of the mantle. The pneumostome is located about mid-way on the right of the mantle. The caudal horn is relatively well-developed. The tail has a distinct, arched keel with a carinate midline. The head and tentacles are black. The mantle may lack distinct papillae and has light borders, which shade into dark blotches and reticulations above. The anterior and dorsal mantle is heavily speckled with dark gray and black. The ground color varies, usually gray to yellowish. The sole and pedal flange are white. There is usually a row of distinct gray to black dots along the sides just above the pedal furrows. Live specimens typically curl their tail around to the side of their body, and when irritated can fling themselves away by sharply thrashing it from side to side.

RANGE

May be found throughout the Olympic Peninsula, Washington. Its range may also extend across the Puget Trough to the western Cascade Range in Washington and to the Coast Range of northwestern Oregon. Washington: Clallam, Grays Harbor, Island, Pacific, and Thurston Counties.

HABITAT

Moist conifer forests. Associated with conifer logs and/or heavy ground cover of low vegetation, litter, and debris.

SIMILAR SPECIES

There are basically two species groups in *Hemphillia*, which probably represent separate genera or subgenera. One group, including *H. burringtoni*, *H. glandulosa*, and *H. pantherina*, has a short, thick body with the visceral mass and mantle covering 50% or more of the total length (in live animals) and a strong posterior dorsal keel. These species are confined as far as known to western WA and adjacent parts of western OR and western BC. The second group has a narrow, rather worm-like body, subdued posterior dorsal keel, and a visceral mass covering less than 50% of the full length. This group, which includes *H. camelus*, *H. danielsi*, *H. dromedarius*, *H. malonei*, and at least two undescribed species, occupies the same territory as the first, but extends also to western MT and the lower Salmon River-Hells Canyon area of western ID.

Caution should be exercised in identification of *Hemphillia* species, as additional undescribed forms are quite possible and color variation is extensive in some forms. Anatomical criteria are best, but need further refinement.

T. Pearce

Figure 22a. *Hemphillia burringtoni*

T. Pearce

Figure 22b. *Hemphillia glandulosa*. In comparison to *H. burringtoni*, the entire dorsal surface may be strongly papillose and it lacks the row of distinct gray to black dots along the sides just above the pedal furrows. *Hemphillia pantherina* (no photo) is also similar, but the posterior one-third of the visceral pouch is not covered by the mantle, and the head and tentacles are white dorsally and pale gray ventrally. Also, the high keel has a distinct white mid-dorsal line and a larger caudal horn.

DESCRIPTION

Adults range from 13-26 mm in length. A distinct visceral hump is covered by the mantle. The shell plate is visible through a slit in the back of the mantle. The pneumostome is about midway or slightly back on the right side of the mantle. Caudal mucous pit is present. The caudal horn is relatively well-developed. The tail has a distinct, arched keel with a carinate midline. The head and tentacles are blue-gray. The mantle is densely covered with distinct papillae. The mantle has light borders, but is speckled with short, dark lines dorsally. On the tail are long, ridge-like tubercles running obliquely from under the mantle to the foot. Wide, dark lines fill the impressed lines between these tubercles, but fade out farther forward. Tubercles on the tail break-up into small polygons posteriorly. The ground color is usually light brown to buff. The sole and pedal flange are white. When at rest, the tail is curled around the side and can be rapidly extended, causing the slug to writhe and jerk about, sometimes resulting in springing off of foliage and traveling some distance to the ground.

RANGE

Western Cascade Range to the Pacific Coast from northern Oregon to British Columbia, Canada. Oregon: Clatsop and Multnomah Counties. Washington: Grays Harbor, Jefferson, King, Lewis, Pacific, Pierce, Skamania, Thurston, and Whatcom Counties.

HABITAT

Habitat similar to *Hemphillia burringtoni*. Conifer logs and/or heavy ground cover of low vegetation, litter, and debris.

SIMILAR SPECIES

There are basically two species groups in *Hemphillia*, which probably represent separate genera or subgenera. One group, including *H. burringtoni*, *H. glandulosa*, and *H. pantherina*, has a short, thick body with the visceral mass and mantle covering 50% or more of the total length (in live animals) and a strong posterior dorsal keel. These species are confined as far as known to western WA and adjacent parts of western OR and western BC. The second group has a narrow, rather worm-like body, subdued posterior dorsal keel, and a visceral mass covering less than 50% of the full length. This group, which includes *H. camelus*, *H. danielsi*, *H. dromedarius*, *H. malonei*, and at least two undescribed species, occupies the same territory as the first, but extends also to western MT and the lower Salmon River-Hells Canyon area of western ID.

Caution should be exercised in identification of *Hemphillia* species, as additional undescribed forms are quite possible and color variation is extensive in some forms. Anatomical criteria are best, but need further refinement.

T. Pearce

Figure 23a. *Hemphillia glandulosa*

T. Pearce

Figure 23b. *Hemphillia burringtoni*. In comparison to *H. glandulosa*, only the mantle will be papillose and it has a row of distinct gray to black dots along the sides just above the pedal furrows. *Hemphillia pantherina* (no photo) is also similar, but the posterior one-third of the visceral pouch is not covered by the mantle, and the head and tentacles are white dorsally and pale gray ventrally. Also, the high keel has a distinct white mid-dorsal line and a larger caudal horn.

DESCRIPTION

Adults may reach lengths up to 6 cm. A distinct visceral hump is covered by the mantle. The shell plate is visible through a slit in the back of the mantle. The pneumostome is located about the middle of the right side of the mantle. Caudal mucous pit is present. The caudal horn is small and inconspicuous. The tail is laterally compressed, but is not elevated into a high keel behind the mantle. The tentacles are dark brown. Ground color is light tan or buff. The anterior half of the mantle has a few scattered, small, black spots. The sides below the mantle are light colored with dark gray mottling beginning under the posterior mantle and increasing in density posteriorly. A light mid-dorsal line (usually brighter than the ground color) runs from behind the mantle to the caudal horn.
There appear to be a variety of localized color variations in this species, ranging from yellow to buff to rich brown. Markings on the mantle of the Mt. St. Helens variety are very distinct brown lines and squares. Some of these varieties may prove to be new species, but for now they best fit the description of *H. malonei*.

RANGE

Has been found from the Cispus River, Lewis County and Thurston County, Washington to west central Oregon.

HABITAT

Moist to wet forested habitats usually with a mixed hardwood component. It may be found on or under debris, often on the underside of bark laying on the ground.

SIMILAR SPECIES

There are basically two species groups in *Hemphillia*, which probably represent separate genera or subgenera. One group, including *H. burringtoni*, *H. glandulosa*, and *H. pantherina*, has a short, thick body with the visceral mass and mantle covering 50% or more of the total length (in live animals) and a strong posterior dorsal keel. These species are confined as far as known to western WA and adjacent parts of western OR and western BC. The second group has a narrow, rather worm-like body, subdued posterior dorsal keel, and a visceral mass covering less than 50% of the full length. This group, which includes *H. camelus*, *H. danielsi*, *H. dromedarius*, *H. malonei*, and at least two undescribed species, occupies the same territory as the first, but extends also to western MT and the lower Salmon River-Hells Canyon area of western ID.
Caution should be exercised in identification of *Hemphillia* species, as additional undescribed forms are quite possible and color variation is extensive in some forms. Anatomical criteria are best, but need further refinement.

Figure 24a. *Hemphillia malonei*

Figure 24b. *Hemphillia malonei*

T. Pearce

Figure 24c. *Hemphillia dromedarius*. In comparison to *H. malonei*, the dorsal color is nearly uniform dark gray and no light mid-dorsal line is visible. The ranges of *H. camelus* (no photo) and *H. danielsi* (no photo), other low-keeled *Hemphillia* species, are not known to overlap that of *H. malonei*. Other undescribed species may occur, and caution is advised in identifying any out-of-range *Hemphillia* species.

DESCRIPTION

Adults range from 15-25 mm in length. The anterior two-thirds of a distinct visceral hump is covered by the mantle. The shell plate is visible through a slit in the back of the mantle. The pneumostome is located about the middle of the right side of the mantle. Caudal mucous pit is present. The caudal horn is large and distinct, triangular in outline, and dark gray in color. The head and tentacles are white dorsally and pale gray ventrally. The light-colored mantle is heavily granulose and covers the anterior two-thirds of the visceral pouch. The mantle is unmarked along the lower margins, but marbled on the dorsal two-thirds with dark stellate markings. The sides are white anteriorly, but the posterior half is marked by 26 large, cell-like granules outlined in black. Posteriorly, it is dusky near the midline, but the high keel is bold white. No other jumping-slug has the posterior one-third of the visceral pouch uncovered by the mantle.

RANGE

Known from a single site near the Lewis River, Skamania County, Washington. It is suspected throughout the Cascade Range of western Washington from the Snoqualmie watershed to the Columbia Gorge.

HABITAT

The known site of *H. pantherina* was in deep forest floor litter near a stream. Its habitat is assumed to be similar to that of other *Hemphillia.*

SIMILAR SPECIES

There are basically two species groups in *Hemphillia,* which probably represent separate genera or subgenera. One group, including *H. burringtoni*, *H. glandulosa*, and *H. pantherina*, has a short, thick body with the visceral mass and mantle covering 50% or more of the total length (in live animals) and a strong posterior dorsal keel. These species are confined as far as known to western WA and adjacent parts of western OR and western BC. The second group has a narrow, rather worm-like body, subdued posterior dorsal keel, and a visceral mass covering less than 50% of the full length. This group, which includes *H. camelus*, *H. danielsi*, *H. dromedarius*, *H. malonei*, and at least two undescribed species, occupies the same territory as the first, but extends also to western MT and the lower Salmon River-Hells Canyon area of western ID.

Caution should be exercised in identification of *Hemphillia* species, as additional undescribed forms are quite possible and color variation is extensive in some forms. Anatomical criteria are best, but need further refinement.

T. Pearce

Figure 25a. No photo is available for *Hemphillia pantherina*. *Hemphillia burringtoni* (above) is similar to *H. pantherina*, but has a black head and tentacles and no bold white mid-dorsal stripe. Also, the mantle covers the entire visceral pouch.

T. Pearce

Figure 25b. *Hemphillia glandulosa*. Also a *Hemphilia* species with a carinate tail, *H. glandulosa* may be strongly papillose on the entire dorsal surface. The mantle covers the entire visceral pouch. Ground color is light brown to buff. The head and tentacles are dark gray rather than white as with *H. pantherina*.

DESCRIPTION

Up to 45 mm length in motion with a slender, unkeeled, tapering body. The body color is somewhat variable, ranging from very pale, cloudy blue to dark steel blue-gray. The head is slightly lighter in color and the tentacles slightly darker. The mantle is relatively large and narrow, covering almost one-third of the back, with a small pneumostome located just in front of the midpoint on the right side. The coloration on the sole of the foot is uniformly pale gray or white, and there is no caudal fossa. The key feature is a pattern of parallel grooves and ridges on the back and flanks. The mucus is colorless and not exceptionally sticky.

RANGE

Puget Trough south through the western Cascade Range of Washington, Oregon, and northern California. It is also suspected to occur on the east slope of the Cascade Range.

HABITAT

Found in a wide range of moist and mixed conifer forests. In open or dry areas, it is usually located in sites with relatively higher shade and moisture levels than those of the general forest habitat. It is typically found in moist plant communities, such as big-leaf maple and sword-fern. This slug is usually associated with leaf and needle litter, wood chips from decomposing logs, mosses, and is known to browse on mycorrhizal fungi species. Fecal analysis in spring of 1998 showed fungal hyphal fragments and structures associated with mycorrhizal fungi root attachment. Spores of hypogeous fungi were also found.

SIMILAR SPECIES

Several possible subspecies or color variants have been recognized for this species, including a very dark form from the Klamath Basin, *var. klamathica*, and a very light race, or possible other, undescribed species of *Prophysaon*. Also, an undescribed bluish species of slug occurs in S.W. Washington that can be easily distinguished from the tail-droppers by the pneumostome positioned well back in the right side of the mantle, and a slight dorsal keel the whole length of the tail.

J.S. Applegarth

Figure 26a. *Prophysaon coeruleum*

J.S. Applegarth

Figure 26b. *Prophysaon coeruleum*. This pale form may represent a new species.

DESCRIPTION

15-20 mm in length. The mantle covers almost one-third of the back, with the pneumostome located just in front of the midpoint on the right side. There are irregular dark brown to black markings on the mantle, often forming two or three irregularly bordered lines. The entire body, except the head and neck, is densely covered with prominent, conical papillae. The tail and sides are marked with thin, dark brown or black impressed lines, fairly evenly spaced and running obliquely down to the foot margin. The two dorsal most lines run irregularly parallel from under the back of the mantle for about one-third the length of the tail, then branch. Color is light brown, sometimes with a reddish or olive tint. The body mucus is colorless and sticky or white and thick.

RANGE

Widespread, found sporadically from the east slopes of the Washington Cascade Range to the Olympic Mountains, and south into northern California. Oregon: Clackamas, Coos, Douglas, Hood River, Lane, and Multnomah Counties. Washington: Chelan, Kittitas, Lewis, Pierce, Skamania, and Thurston Counties.

HABITAT

Appears to be strongly associated with hardwood logs and leaf litter. It has been found in sites that are similar to, but somewhat more exposed than those described for *Prophysaon coeruleum*. It has been located in association with fungal fruiting bodies of species such as *Suillus* and *Lactaria*. Fecal analysis in spring of 1998 showed fungal hyphal fragments and structures associated with mycorrhizal fungi root attachment. Spores of hypogeous fungi were also found.

SIMILAR SPECIES

Prophysaon andersoni

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Figure 27a. *Prophysaon dubium*

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Figure 27b. *Prophysaon dubium*

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Figure 27c. *Prophysaon andersoni*. Much larger, with a distinct lighter dorsal line and a granulate (rather than strongly papillose) mantle. Lateral lines on the tail form a reticulated, or diamond-shaped pattern which is distinct among the *Prophysaon* slugs.

adnate (adj.) Barely attached to or in contact with; refers generally to contact of last whorl with preceding one. See **appressed**.

angular, angulate (adj.) Having an angle (or having the tendency to form an angle), rather than a round contour.

aperture (n.). The opening or "mouth" of a snail shell through which the body protrudes when the snail is active.

apex (n.) The tip of a shell, farthest away from its aperture.

appressed (adj.) Well-attached to or clearly in contact with; refers generally to contact of last whorl with preceding one. See **adnate**.

basal (adj., n.) That part of shell peristome opposite the apex; a tooth or lamella located in that portion of the shell aperture. As regards the natural life position, the base is the anterior end. When held with the apex directed upward, the base is the bottom of the shell.

basal crescent (n.) Depressed area of, or immediately adjacent to, columella, often crescent or wedge-shaped, generally with closely spaced prominent growth lines or striae. Used in regard to shells of Hydrobiidae and related freshwater snail families.

body whorl (n.) The last whorl of a spiral shell, measured from the outer lip back to a point immediately above the outer lip.

broadly conic (adj.) Shell conic, as wide or wider than high.

carinate (adj.) Forming a ridge or keel, such as around the shell periphery or on the tail.

caudal horn (n.) Small, horn-shaped projection or protuberance at posterior end of snail, above mucous pore.

caudal pit (n.) A depression in the posterior dorsum of the foot of some snails which contains mucous glands.

collabral (adj.). Parallel to the lip of a snail shell. Said of shell sculpture such as ridges or ribs. Sometimes called "transverse". Some older literature uses the term "axial," but this is less appropriate because sculpture rarely runs parallel to the axis of the shell.

columella (n.) The internal column around which the whorls revolve; the axis of a spiral shell; especially the exposed expression of this structure on the last whorl. The adjective is columellar.

compressed (adj.). Appearing flattened; relatively plane as opposed to convex. Usually said of the whorls of a shell, the body whorl, or the base of the shell.

conic or conical (adj.). Having approximately the shape of a cone, i.e., tapering evenly from a wide, circular base to a point. Said of the shell. A **broadly conic** shell is as wide or wider than high; a narrowly conic shell is markedly higher than wide.

crenulated (adj.). Notched or scalloped in outline.

crescentic (adj.). Having the shape of a crescent moon. Generally said of the shape of an aperture or of a lamella that, rather than being straight, curves through a shallow arc.

crest (n.) In pupillid and other land snails, a thickened area of the shell immediately or closely behind the shell aperture.

crustose (adj.). Having a crust of irregular, granular, deposits of shell material. Said particularly of the margin of the mature shell lip in some Haplotrematidae, where the deposits almost resemble a border of glued-on sand or silt grains.

deflected (adj.). Bent downward from the preceding trajectory of growth, as in the terminal part of the last whorl of some snail shells.

depressed (adj.). Flattened dorso-ventrally or from apex to base. Said of the shell. Sometimes used in combination with other adjectives describing shell shape; e.g., a depressed-globose shell is one that is somewhat flatter than globe-shaped.

depressed conic (adj.) Conic shell depressed dorso-ventrally or postero-anteriorly; more specifically, with an apical angle of about 100E.

discoidal (adj.) Round and flat like a disk.

disjunct (adj.) Refers to whorls or portion of shell not in contact with preceding whorls (portion of shell); detached; loosely coiled shell, wholly or in part, with the whorls not touching one another.

elongate conic (adj.) Conic spire with an apical angle of about 30˚.

embryonic shell (n.) The earliest whorls that are formed in the egg.

excentric (adj.) Not placed in the center; refers most often to the nucleus of an operculum.

external genital pore (n.). The hole by which the reproductive system reaches the exterior of the animal. In most pulmonate land mollusks it is located on the right side of the body, posterior to and slightly below the right ocular tentacle.

foot (n.) The locomotory organ of mollusks; the long, broad, ventral surface of the animal.

globose (adj.) Shaped like a sphere, i.e. with equal width and height and broadly rounded sides.

globosely conic (adj.) Conic spire with an apical angle of about 70˚.

heliciform (adj.) See **helicoid**.

helicoid (adj.). In the form of a low three-dimensional spiral; with a somewhat depressed spire and whorls that increase regularly in diameter. Also (and less frequently) called "**heliciform**".

imperforate (adj.). Having no umbilicus. Said of a snail shell in which the inner sides of the coiled whorls are pressed together, leaving no central cavity along the shell axis; or, if the whorls are not pressed together and a cavity is formed, then in adult shells its opening is completely covered by callus or the reflected columellar lip of the aperture.

impressed (adj.) Marked by a furrow.

inflated (adj.). Appearing swollen; strongly convex as opposed to flattened. Usually said of the whorls of a shell, the body whorl, or the base of the shell.

keel (n.) A sharp edge.

lamella (n., plural "lamellae"). A calcareous plate, blade, "tooth," or scale-like structure on the shell of a snail. Most commonly used to refer to structures of this shape that project into the aperture, and sometimes restricted to such structures occurring on the parietal and columellar sides of the aperture, those on the outer sides of the aperture being called "folds" or "plicae".

lamellar (adj.). Plate-like, blade-like, or scale-like (i.e., as opposed to more broadly rounded). Generally said of ribbing or other sculptural features of the shell.

lappet (n.) A fold, small flap, lobe, or loose hanging portion.
lenticular (adj.). Having the shape, in lateral view, of the cross-section of a convex lens, i.e., broadly convex above and below, angulate at the sides.

lineolate (adj.) Marked with minute lines.

lip (n.) Edge of aperture of the shell; also called **peristome**.

lirate (adj.) Ornamented with sharp, raised threads, marked with parallel grooves or ridges; having thread-like sculpture (lira, pl. lirae).

maculate (adj.) Having irregular-shaped spots of contrasting color.

malleation (n.). A texture of the surface of a shell in which the surface bears numerous small, rounded dents, as if a sheet of metal had been beaten with a ball-peen hammer. The individual dents ("malleations") may be densely or sparsely distributed.

mantle (n.) A fleshy tunic; a membranous covering of a mollusk that secretes the shell from marginal glands and provides the periostracum; pallium.

mucronate (adj.) Terminating abruptly in a short sharp point or spine.

mucus (n.) A viscid, slippery secretion.

multispiral (adj.) Numerous, very slowly enlarging whorls, spirals, or coils.

neanic (adj.). Post-embryonic. Said of the whorls of a snail shell that develop after the snail hatches from its egg. Embryonic whorls (i.e., those at the apex of the shell that develop while the snail is within its egg) are often differently sculptured from the neanic whorls that follow them.

neritiform (adj.) Subglobose or hemispherical, with few, rapidly enlarging whorls, very reduced spire, and a heavily callused and expanded parietal apertural margin.

node (n.) A knob or swelling.

nucleus (n.) The first part or beginning of a shell or **operculum**.

ocular tentacle (n). One of the upper pair of the two pairs of elongated, flexible organs on the head of snails and slugs, bearing an eye at the tip. Also sometimes called "superior tentacle," "ommatophore," or "eyestalk."

operculum (n.) A horny plate that serves the purpose of closing the aperture when the snail withdraws into the shell.

ovate (adj.). Having the shape of the longitudinal section of a hen's egg, i.e., oblong and curvilinear, with one end narrower than the other.

palatal (adj., n.) Outer lip or tooth or lamella in this area; that portion of the lip between the parietal wall and the basal lip; term used particularly for pupillid and related land snails.

parietal (adj.). Describing the wall of the shell aperture that represents the outer wall of the preceding whorl.

parietal lamella is a tooth-like or blade-like calcareous structure borne on the parietal wall and projecting into the aperture. Pertaining to the inside wall of the shell aperture, i.e., that portion in contact with the preceding whorl. (A synonym is "parietal tooth," although it is better not to refer to shell structures as "teeth," to avoid confusion with the teeth of the radula.)

periostracum (n.). The thin, proteinaceous outer layer of the shell.

periphery (n.). The edge of the shell as seen in outline; that part of the shell which is farthest away from the axis.

peristome (n.) The thickened rim or lip around the mouth; the lip or margin of the aperture of a spiral shell.

plication (n.) A small fold or corrugation that affects the whole shell but does not thicken it.

pneumostome (n.) The opening to the pulmonary cavity, specifically in pulmonate snails.

protoconch (n.) That portion of the shell that is developed in the egg, prior to hatching; also termed embryonic whorls.

pupilliform (adj.) Shaped like a small pupa or cocoon; refers to a common shell form in the Pupillidae and families with similar shell morphology.

reflected (adj.) Turned back; refers to edge of **peristome** or lip.

retractive (adj.) Oriented opposite of the direction of coiling.

revolute (adj.) Rolled back; refers to edge of **peristome**.

rounded (adj.) Having an evenly curved periphery, not **angular** or **carinate**.

rugae (plural n.; singular "ruga" but rarely used). Convex, usually collabral, undulations of the shell surface, roughening it but not rising to the prominence of ribs. In cross-section through the shell wall, rugae would appear simply as outward undulations of the shell, whereas ribs would show actual thickening of the shell material.

sculpture (n.) The natural surface markings on snail shells.

sinulus (n.) A dent or invagination in the palatal wall of the aperture; used especially for pupillids.

solid (adj.). Firm, substantial. Said of the composition of a snail shell, as opposed to thin or delicate.

spiral (adj.). Winding, coiling, or circling around a central axis; winding around a fixed point and continually receding from it; the form of the shell of most snails. Generally said of shell sculptural features such as striae; the opposite of "collabral" or "transverse."

spire (n.) The whorl series of whorls of a spiral shell, excepting the last.

striae (plural n.; singular "stria" but rarely used). A narrow superficial groove or fine furrow on the outer shell surface. Properly, the term refers to a feature that is incised below the general shell surface, but it is also sometimes used for streaks or fine threadlike lines that are raised above the shell surface.

subangulate or subangular (adj.). Describing the periphery of a shell in which the top and bottom surfaces of the whorl come together to almost form an angle, but the actual profile is rounded.

sulcus (n.). A relatively broad, shallow furrow on the surface of a shell.

suture (n.) The line of junction or seam along which two hard structures join; a continuous spiral line marking the junction of whorls in a gastropod shell.

tumid (adj.). Appearing swollen; broad as opposed to slender. Usually said of the whorls of a shell, the body whorl, or the base of the shell.

umbilicus (n.). The central opening or cavity along the axis of a shell that is formed when the inner sides of the coiled whorls are not pressed together. A shell with the umbilicus showing prominently in basal view is termed "umbilicate".

varix (n.). A transverse or collabral thickening of the inner or outer wall of the shell. The term is usually restricted to a structure that occurs once or a few times during the growth of the shell, as opposed to regular, closely repeating ribbing or striation.

Field Guide to Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan